AGRICULTURAL NEWS LETTER

VOL. 4 - NO. 10 OCTOBER, 1936

THIS PUBLICATION GIVES INFORMATION on new developments of interest to agriculture based on the work done by scientists and agricultural field men of the du Pont Company and its subsidiary companies.

It also gives reports of results obtained with products developed by these companies in the field whether the tests are made by field men of the companies, by agricultural experiment stations or other bodies. Also data on certain work done by agricultural stations on their own account and other matters of interest in the agricultural field.

This issue contains:

Issued by
Publicity Department,
E. I. du Pont de Nemours & Co.,
Wilmington, Del.

Printed in U.S.A.

THE SAFETY PROPERTIES OF "FREON" REFRIGERANTS AND OTHER CHARACTERISTICS ARE HIGHLY VALUABLE

EDITOR'S NOTE:- Few things are of greater economic value to agriculture than the development of mechanical refrigeration and refrigerants such as those now available. Therefore, this discussion of the "Freon" group of refrigerants should be of considerable interest.

By R. J. Thompson,
Refrigeration Engineer,
Kinetic Chemicals, Inc.,
Wilmington, Delaware.

It is a recognized fact that mechanical refrigeration is an essential factor in the wide distribution of perishable foodstuffs. Refrigeration insures to centers of population, particularly the large metropolitan areas, adequate supplies of dairy products and meats at all times of the year. Vegetables and fruits are made available in cities of the North at all seasons through cold storage and shipments from the tropics and sections of this country where they are grown. Obviously, without refrigeration, many kinds of foods would need to be consumed within a comparatively short distance of where they are grown. This, of course, would not meet the requirements of present day civilization. Also is to be considered the loss of markets by growers of many products of the soil.

The statement has been made that the health---and, perhaps, even the lives---of the inhabitants of the great cities depends upon mechanical refrigeration, for if by any chance there should be a failure of the refrigeration system in processing, in transit, or in storage, food supplies would spoil and hunger and panic would result within a short time.

Safe and Dependable Refrigerants Developed

Recognizing the necessity for refrigerants which would be safe and dependable at all times and under all conditions of use, extensive research was carried on, with the result that the "Freon" group was developed. These refrigerants are not by-products of any chemical plant, and, as has been indicated, they were not chance discoveries. They were introduced in 1930.

The group consists of: "Freon-12," dichlorodifluoromethane, CCl_2F_2, the most prominent member and used in reciprocating type of compressors: "Freon-114," dichlorotetrafluoroethane, $C_2Cl_2F_4$, used in

Continued on next page

rotary type compressors and "Freon-11," trichloromonofluoromethane, CCl_3F, which is used in centrifugal type compressors.

All of these refrigerants are odorless, when mixed with air, while the odors of 100% vapors are very mild and somewhat ethereal. The vapors in all concentrations are non-irritating to the skin, eyes, nose, throat and lungs and being odorless and non-irritating eliminate all possibilities of a panic hazard occurring should they accidentally escape from an air conditioning, commercial, industrial, or household system.

"Freon-12," "Freon-114," and "Freon-11," liquid and vapor, are non-flammable, and non-combustible as their vapor-air mixtures are not capable of propagating a flame, for they contain no elements which will support combustion and, therefore, do not endanger either life or property. Complete and detailed data on flame extinguishing properties are available in Bureau of Mines' Report, RI-3042 and the Underwriters' Laboratories Report, MH-2375.

It is now known that "Freon-12," "Freon-114" and "Freon-11" are less toxic than carbon dioxide. This is a remarkable fact in itself, as prior to April, 1930, it was not known to the scientific public that there were compressed gases possessing valuable properties as refrigerants that were less toxic than carbon dioxide. It is a well-established fact that these refrigerants as such, are the least toxic refrigerants that have yet been discovered. Complete and detailed data on toxicity are available in Underwriters' Laboratories Report, MH-2375 and the Bureau of Mines' Report, RI-3013.

"Freon-12," "Freon-114," and "Freon-11," are non-corrosive to all metals or materials used in refrigerating apparatus and this feature permits the manufacturers a wide selection of materials with which to design and produce efficient condensers, evaporators, compressors, control apparatus and pipe lines. These refrigerants are stable and inert and will withstand indefinitely repeated evaporizations, compressions and condensations without disassociation or variation of their properties.

"Freon-12," "Freon-114," and "Freon-11," liquid or vapor, is not absorbed by and has no effect on any materials being refrigerated and their vapors have no effect on the odor, taste, color or structure of dairy products, meats, eggs, vegetables, etc., have no effect upon the odor, color, continued blooming or structure of flowers or plant life and the liquid or vapor has no effect upon the color or structure of furs or fabrics.

Tests and Conclusions

The Tropic Foods, Inc., distributor of the United States Fruit Co., has the following to say after having concluded extensive tests to

Continued on next page

determine the effect of "Freon-12" on bananas at different stages of ripeness:

> "---Our experiments show that 'Freon' in concentrations from 0 to 20% did not cause any injurious effect. --- The effect of any amounts that might leak from refrigerating equipment would be negligible."

In March of 1935, Mr. Clarence E. Baker, Assistant in Pomology, Purdue Agricultural Experiment Station, Lafayette, Indiana, started tests as to the effect of "Freon" on fruit in storage. The following quotations are taken from his detailed report, whose results were given in HEATING, PIPING AND AIR CONDITIONING of March, 1936, page 94:

> "---There is no immediate harmful effect to apples from confinement in an atmosphere of nearly pure 'Freon,' even at room temperatures. --- This test indicates that the 'Freon' appears to have had little effect on the discoloring of fruit of the varieties used when held in closed containers without a change of air for an extended period."

In testing the effects of "Freon" vapor on various cut flowers, specimens of chrysanthemums, roses, daisies, sweet peas, violets, lilies, carnations, baby breath and decorating ferns were obtained. These flowers were kept in a vase of water and left under a bell jar with a 100% concentration of "Freon" for a period of 16 hours. After a test period of two days, it was apparent that the "Freon" refrigerant vapors had had no deleterious effect on the flowers since the flowers in the refrigerant vapor were as fresh and true in color as similar flowers exposed under a bell jar containing only air.

Sometime ago, the Boyce Thompson Institute, Yonkers, New York, conducted tests as to the toxicity of "Freon-12" to plant life and especially young tomato plants, which they believed to be the most susceptible to gases. The following is quoted from a letter received after results of tests were obtained:

> "---'Freon-12' is much less toxic than ordinary illuminating gas. It should be safe for use as a refrigerant in botanical laboratories --".

Other tests that have been conducted by manufacturers of refrigerating machinery were to expose samples of ice cream, butter and milk to a saturated atmosphere of "Freon-12" for a period of hours, after which the samples were allowed to stand for a short time and then tested to determine whether or not there was any difference

Continued on next page

in taste detectable which might have been caused by the refrigerant. Several people participated in the taste test and none of them could detect any taste of the refrigerant in any of the samples.

Samples of spinach, carrots, parsnips, peas, string beans, tomato, celery, green pepper, onion, radish, white grapes, apple, turnips and lettuce were exposed to saturated atmosphere of "Freon-12" for a period of 16 hours and then examined. There was no apparent action of the refrigerant on any of the materials and the samples subjected to the refrigerant vapor were as fresh and crisp as those under the bell jar containing only air. In fact, it appeared that some of the vegetables were in better condition in the "Freon-12" atmosphere than those in the air. For instance, the green string beans appeared to be fresher and had considerable more "snap" when broken; while the celery also appeared firmer and less wilted. In order to determine whether or not the materials had been affected as to taste, all suitable materials from the "Freon-12" tests were combined to make vegetable soup and this was sampled by members of the group and all agreed that the materials had not been injured by the exposure to "Freon-12".

In testing for the possible effects of "Freon-12" on meats, samples of the following materials were obtained: beef steak, mutton chop, veal cutlet, pork chop, hamburg (beef and pork), ham (cold boiled), pressed ham, bacon and pimento loaf. These materials were divided into 2 groups, the first group being held as a control under a bell jar and not exposed to any action of the refrigerant. The second group was placed under a bell jar in a saturated atmosphere of "Freon-12" and then both the control and the test specimens were placed in a refrigerator which was being maintained at a temperature of approximately 45°F. for a period of 16 hours. The color and general appearance of the meat was comparable with the samples held as standard. Some of the meats were afterwards cooked by frying and after cooking there was no taste of the refrigerant. Samples of the cold meats, which were cooked, were free from any taste of the refrigerant after standing in the open for a few hours.

The Importance of Mechanical Refrigeration

Mechanical refrigeration has long been recognized and accepted as the only way to keep perishable products in a salable and edible condition. Furthermore, health authorities demand it and acknowledge that refrigeration is a positive means of stopping microbial activity and retarding food spoilage, but to have food products in a fit condition to be stored for resale, it is necessary that safe refrigeration be installed at the point where those food products are processed. Mechanical refrigeration is just as important on the farm and in rural communities as it is in the large cold storage plants, retail shops and the home.

Continued on next page

Milk must be cooled to within 40° to 50° within two hours after milking to check bacterial growth. Eggs must be stored at temperatures of 30° to 31° to supply the demand in the fall and winter, otherwise the market is flooded in the spring and summer. Fruits, berries, and vegetables must be pre-cooled before shipment to market. Poultry and meats must be refrigerated immediately after being dressed and even tobacco, candy, nuts and, in fact, all foodstuffs must be refrigerated in all or certain stages of handling. In many cases the sooner the materials are placed under refrigerating conditions the higher will be the quality of the materials produced and profit to the producer.

The rapidly growing refrigerating industry of the world has been founded on the fundamental principle of safe and proper preservation of food and today there are 58 manufacturers of refrigerating equipment safeguarding the life and health of the public by using these ultra-safe refrigerants in their equipment, which is employed in thousands of installations in homes, hotels, apartment houses, hospitals, railway cars, office buildings, restaurants, stores, libraries, merchant ships, submarines and other naval craft.

Note: Technical papers, giving the chemical, physical, and thermodynamic properties of "Freon-12," Bureau of Mines' Reports, Underwriters' Laboratories Reports, and reprints of various articles, are available from Kinetic Chemicals, Inc., Tenth & Market Streets, Wilmington, Delaware.

THE PRESENT STATUS OF SEED TREATMENT DISCUSSED AT AMERICAN SEED TRADE ASSOCIATION CONVENTION

EDITOR'S NOTE:- Growth of interest in seed disinfection for the control of plant diseases is evident in many quarters. A contribution to a better understanding of the present status of seed treatment was made in an address by Dr. Haskell at the Annual Convention of the American Seed Trade Association, Dallas, Texas, June 30, 1936. A part of this talk is presented here. The rest will appear in an early issue.

By R. J. Haskell,
Extension Plant Pathologist,
Extension Service,
U. S. Department of Agriculture.

From time to time, during the last few weeks I have been interested in looking over 1936 seed and nursery catalogues of which there are some 900 on file in the Department of Agriculture Library. In this collection are included those of most of the firms represented here today.

The primary object of my search was to find out what firms are listing the varieties of vegetables and flowers that are known to be resistant to disease.

It is a satisfaction to note that many companies are now listing and featuring the newer and better disease resistant sorts, that have been developed by the State Colleges, the U. S. Department of Agriculture and the trade, and to realize that users of these seed will experience little if any loss from the diseases to which these selections are resistant. The older originations such as the Washington strains of asparagus, and the Virginia blight resistant spinach are among the most popular varieties of those vegetables. The Marglobe, Pritchard and Break O'Day tomatoes resistant to wilt are generally listed and very widely used as are also the Wisconsin strains of yellows-resistant cabbage, and the new hybrid sweet corn, Golden Cross Bantam. Beans resistant to mosaic, anthracnose and blight, muskmelons resistant to powdery mildew, lettuce resistant to brown blight and mildew, celery resistant to yellows, peas, watermelons, and asters resistant to various forms of wilt and rustproof snapdragons are all filling increasingly important places and helping solve the problems of disease control.

Continued on next page

Much more must be done, however, the surface has just been scratched and the next decade is sure to see remarkable progress in this direction.

Another thing that pleased me in the perusal of the catalogues was to note that several companies are advertising treated seed. Seed that has been disinfected to rid it of disease germs. Most companies are limiting their treatment to one or a few kinds of seed but at least one company is treating practically all seeds, each kind being given its own special treatment, adapted to the needs.

In the brief time allotted to this subject of seed treatment I would like to take up the question of why seed treatment is desirable, tell something about the methods and materials used, discuss recent developments in the treating of cereal, vegetable and other seed and finally, the practicability of treatment by seedsmen.

Why Treat Seed

First let's ask the question, Why treat seed? We all know that many of the most destructive plant diseases are transmitted on, in, or with the seed. Bean anthracnose and blight, tomato bacterial canker and the cereal smuts are typical examples. When looking over one of the important celery producing areas in Florida in March of this year I found growers much concerned about the appearance of late blight on young celery plants. On one farm plants from seed from two different sources had been set out. One lot was generally diseased, the other generally clean except for a few adjacent rows where the disease was spreading over from one to the other. The late blight fungus had come in with the seed and needless to say the growers were not satisfied with that seed source.

You have probably seen the bulletin from the West Virginia Experiment Station issued in 1931 entitled "Seed-Borne Parasites." This lists 477 different bacteria and fungi that are carried with the seed and this does not include those carried with bulbs, tubers or other vegetative means. Since the bulletin was written many others have been found. The seed is a very important and common source of infection.

These seed carried parasites may be either externally borne or internally borne. If external, as in the case of oat smut for example, they may be killed with proper chemical treatment. If internal, as in the case with black leg of cabbage, a hot water treatment may be used. Many of these parasites are of the damping-off type causing seed decay, seedling blights and root rot. Others are diseases of the plant in all its stages of maturity, attacking various parts and spreading in the field. These facts must be considered when deciding on the kind of seed treatment to be given.

Continued on next page

Some of the treatments not only disinfect the seed but protect them and the seedlings to a certain extent from attack by damping-off fungi that may be in the soil. Seed treatment, therefore, helps free the seed from disease and may also protect it and the young plant from decay. That is the reason why we treat seed.

Many Seed Treating Methods and Materials Used in the Past

It is said that in India the natives made it a practice for many years to throw sorghum seed through the flame of a fire to rid it from smut. The story goes that a shipload of wheat was sunk and later salvaged off the coast of England in 1760 and planted and found to be remarkably free from smut. This gave rise to the brining method of cereal seed treatment.

In New Mexico a few years ago I ran across the practice of soaking seed wheat in alum solution for smut control. The alum occurs in natural deposits there and all the local people have to do is to get some of this and dissolve it in water. I secured some of this material and it was tried out by our cereal division but found to be only partially successful as a smut preventive.

From these primitive methods we have progressed to the seed treatments of today.

At the present time our principal seed treating materials and methods may be classified about as follows:

1. Non-metallic substances such as formaldehyde, sulphur, hot water, hot air, etc.

2. Copper compounds especially the sulphate, carbonate (used in dust form on wheat) red oxide (used on vegetable and flower seeds for damping-off control) and others.

3. Zinc oxide - for damping-off control of vegetables and flowers.

4. Mercury compounds which are very toxic to bacteria, and fungi in general. These include the old standby mercuric chloride or corrosive sublimate, the yellow oxide which is popular in New York State as a dip for potatoes, and the newer organic mercury compounds such as ethyl mercury phosphate and others sold under such trade names as "Ceresan," "Merko," "Barbak" and "Semesan."

These materials are applied in different ways as liquids in which the seed is soaked, as sprays, or as dusts. The recent trend has been away from wet treatments and toward dry dusts.

It is not an easy matter to develop an efficient and practical seed disinfectant. It not only has to be effective in disinfecting, but

Continued on next page

it has to be non-injurious to the seed itself with a rather wide margin of safety to take care of varying conditions. Other factors have to be considered too, such as effect of storage on germination of treated seed, injurious effect on persons, possible corrosive effects on machinery, stability and physical nature of the compound and cost.

Recent Advances in Cereal Seed Treatment

The formaldehyde treatment of cereals has been widely used in this country since 1896. In 1920 copper carbonate was introduced as a treatment for wheat and rapidly became widely accepted as a control for the stinking smut or bunt. It was a dry dust, did not wet the seed, easy to apply, treated seed could be stored and there was some protection from soil-borne diseases and therefore met with favor.

The organic mercury treatments were at first wet treatments and began appearing in this country about 1920. The dry organic mercury treatments were first marketed about three years later. Since then they have been narrowed down and improved so that today we have an organic mercury dust that more nearly meets the requirements for all round cereal seed treatment than anything we have had before. It can be used on wheat, oats, barley, sorghum and flax at the same rate and applied in the same way, thus making it possible to simplify treatment. It is easy to apply, treated seed can be stored, no drilling difficulties are experienced, injury to health may be avoided by a few simple precautions, and it is inexpensive. It not only disinfects the seed but it protects it from rotting in the ground, thus insuring better stands.

With the coming of these new dust disinfectants there has come also during the past two years a very rapid development of machinery for doing the treating in an easy, large-scale way.

The great drought of 1934 served to give large-scale treatment a boost. To guard against a seed shortage you will remember that the Federal Government bought several million bushels of wheat, oats and barley. Elevators distributing this and also commercial companies cooperated in devising large-scale treating apparatus to meet the needs of these elevators. In general they consisted of mechanical devices for measuring and mixing grain and dust disinfectants. These machines do the treating as fast as the grain can be loaded into the farmers truck.

As a result of this activity over 100 distributing stations in the Northwest installed treating equipment. Much treating was also done on the farms. Two elevators in Minnesota treated over 45,000 bushels each. In Minnesota and North Dakota sales of seed-treating materials, largely organic mercury, were enough to treat more than 2½ million bushels of seed grain. This was considerably more than double the sales of 1934.

Continued on next page

Another disaster in the spring wheat states last year gave seed treatment in that area another push forward. That was the epidemic of black stem rust. Germination tests showed seed wheat from rusted fields to be of low vitality, lacking in vigor, and moldy. Tests at Fargo, St. Paul and Washington, D. C., further showed that emergence and stand of plants were much improved by treatment with organic mercury dust. At the Minnesota Experiment Station the average emergence of untreated wheat seed was 71 percent while that for treated seed was 85 percent. In Washington it was 12 percent increase in one case and 9 percent in another. At Fargo, N. Dak., and in Manitoba, Canada, similar increases were obtained.

Seed treatment was therefore particularly stressed again this last winter and spring by extension forces in that area. Recent reports indicate another big increase in the use of organic mercury dust.

Centralized or community seed treating is on the increase. In one Iowa town last year a Farmers Grain and Supply Co. treated about 11,000 bushels of grain for local farmers. Just last month I visited a Virginia County where a centralized farm seed cleaning and treating center has been established. Last year they had all the business they could handle and now the plant capacity is being doubled with the addition of hot water treatment equipment for the control of loose smut of wheat.

Portable cereal seed treating outfits mounted on trucks and usually in combination with cleaning equipment started in the West with the advent of copper carbonate. The organic mercury dust makes it possible for these outfits to extend their operations to other cereals. In California there are several such outfits doing custom treating. One California company operated a fleet of four trucks in 1935 and treated 303,842 bushels of grain during the season.

In Southern Indiana and Illinois a fleet of seven trucks cleaned 121,000 bushels of wheat in 1934 and treated about one third of it. This coming fall the number of these trucks will be increased by the addition of two or three more in the St. Louis area.

A Pennsylvania Seed Company profitably operated two portables last year and had more business than they could handle so they are adding another machine this summer.

Several seed companies have taken up treatment of cereal seed in a large way. One large Virginia firm treated about 100,000 bushels of wheat, oat and barley seed last year. If these treated seed yield at the rate of 20 bushels for each bushel sown the beneficial effects of the treatment will be extended to 2,000,000 bushels of grain.

Two large cooperative concerns, one in New England and the other in New York have taken up cereal treatment during the last two or three years in a large way.

RATE OF DOLOMITE REACTIONS IN MIXED FERTILIZERS DISCUSSED AT AMERICAN CHEMICAL SOCIETY MEETING

EDITOR'S NOTE:- This is a summary of a paper presented at the 92nd National Meeting of the American Chemical Society, Pittsburgh, Pennsylvania, September 7-11, 1936. The data given should be of value to those engaged in fertilizer research.

By F. G. Keenen and W. A. Morgan,
Ammonia Department,
E. I. du Pont de Nemours & Company.

The recent application of dolomite as a suitable source of magnesia and a soil neutralizing agent has brought about its widespread use in commercial mixed fertilizers and created new problems in their production. Loss of available phosphate was encountered in factory storage piles, especially in cases where the piles were warm as a result of ammoniation. Although dolomite was recognized as less active than ordinary limestone in this respect, and the nature of its reactions with superphosphate and ammonium phosphates had been investigated, the rates and controlling factors in complete commercial fertilizer mixtures remained undefined.

Storage tests at 86°, 110° and 130°F. with periodic analyses were made for eight months on 4-8-4, 4-10-4 and 2-12-2 non-acid forming mixtures which had been ammoniated with 18, 27 and 36 pounds per ton of free ammonia added as Urea-Ammonia Liquor. Two distinct reactions were found to occur during storage. The primary one involving dolomite was with mono-ammonium phosphate converting a third of it to di-ammonium phosphate and the remainder to water insoluble magnesium and calcium phosphates. This substantially reduced the water soluble phosphate content, but caused no loss of available (citrate soluble) phosphate. The available phosphate loss resulted from secondary reactions of di-ammonium phosphate, calcium sulfate and di-calcium phosphate; ammonium sulfate being formed and the phosphates converted into compounds of lower citrate solubility.

The rates of these reactions were primarily dependent upon temperature and approximately doubled for each 13°C. (23°F.) use. They were so slow below 110°F. as to be of no practical significance except in fertilizer stored longer than six months. In 12% P_2O_5 grades 100-125 lbs. dolomite per ton reacted during six weeks' storage at 130°F., but only 40-50 pounds at 110°F.; 8% P_2O_5 grades involved just half as much dolomite in equivalent time intervals.

Continued on next page

The citrate insoluble phosphate found by A.O.A.C. methods of analysis was proportional to time and temperature of storage, degree of ammoniation and to a very marked extent upon concentration of P_2O_5 in the fertilizer. A 12% P_2O_5 mixture showed two to three times more insoluble P_2O_5 than an 8% mixture, even though both had been treated with identical amounts of ammonia. This was attributed to analytical factors and not to mass action effects upon reaction equilibria. Quantity of dolomite was of little influence since 100 pounds per ton sufficed for complete reaction with the mono-ammonium phosphate in 8%-10% P_2O_5 grades, and non-acid-forming mixtures usually contained considerably more than this.

In commercial fertilizer mixing operation it seems advisable to avoid extended storage of ammoniated goods containing dolomite at temperatures above 110°-115°F. Under existing analytical methods of evaluating available phosphate, considerably greater precaution must be taken to avoid apparent phosphate reversion in grades containing more than 10% P_2O_5, except where such goods are "bases" to be remixed later into lower grades in the same factory. Trade experience during the past one or two seasons has shown that little trouble is encountered in the use of dolomite when the foregoing conditions are met.

A NEW WATER-CLEAR PLASTIC AS STRONG AS GLASS MAY BE FOUND USEFUL IN THE AGRICULTURAL FIELD

EDITOR'S NOTE:- This announcement of a new type of plastic is made as a matter of general interest. It is, of course, too early to even suggest uses for this product in the agricultural field. However, various purposes for which the plastic can be used may be found. The facts given here are from a paper presented by Dr. H. R. Dittmar of the du Pont Experimental Station at the 92nd National Meeting of the American Chemical Society, Pittsburgh, Pennsylvania, September 7-11, 1936.

A new water-clear plastic, strong as glass, flexible, and non-shattering will be introduced under the trade name of "Pontalite" by E. I. du Pont de Nemours & Company. A factory for making the plastic is under construction. Production is scheduled to begin early in 1937.

This plastic, known to chemists as methyl methacrylate polymer, is only half as heavy as common glass. It is as clear as optical glass, and is so strong that it will resist a tension of 4 to 5½ tons a square inch.

Though softer than glass, the plastic is hard enough to be widely useful. It can be sawed, cut, turned, drilled, and polished, and being thermo-plastic, it can be molded to any desired form. A liquid, intermediate variety can be poured into molds and hardened, and in this way castings are made readily. Unlike glass, this plastic transmits a large proportion of the sun's ultra-violet light. It is, moreover, unaffected by sunlight, and in general is not affected by other destructive elements.

"The transparency, brilliance, strength, and permanence of 'Pontalite' are unusual", says Dr. Dittmar, "and the absence of color permits fabrication into delicate tinted shades. By combining dyes and pigments, varying degrees of color and transparency can be obtained. The value of the plastic is enhanced by the ease with which it can be worked, and the crystal-like transparency indicates many uses where strength, lightness, and ultra-violet transmission are desired."

Dr. Dittmar says further that solutions of the plastic, also the liquid intermediate form have been used successfully as impregnants for wood, cloth, paper, stone, and electrical apparatus. Materials

Continued on next page

treated in this way are much more resistant to water, oils, and chemicals. For example, when wood is treated with the plastic, the strength is increased, as is resistance to water absorption, warping, and the action of chemicals. Though "Pontalite" can be burned, it is not flammable in the ordinary sense; it is definitely a "safety" plastic. Many chemical variations of the plastic can be produced, having a wide range of properties, all the way from hard, heat-resistant solids to heavy viscous liquids.

AMERICAN ZINC INSTITUTE HAS COATING STANDARD FOR GALVANIZED SHEETS USED FOR MANY PURPOSES

EDITOR'S NOTE:- The importance of a standard for zinc coating of iron and steel sheets is evident from the fact that annually farmers and others are saved large sums because of the durability imparted to galvanized sheets for farm and other structures.

By Ernest V. Gent, Secretary,
American Zinc Institute, Inc.,
60 East 42nd Street, New York.

There are 37 million farm buildings in the United States, which are subject to destruction by lightning and fire. It is said that one of these buildings goes up in flames every 15 minutes.

If every farmer knew that galvanized roofs and siding on his buildings would go a long way to protect him from fire loss, if he knew that a galvanized roof can easily be made lightning-proof, there would be far fewer fires, crops and live stock would be protected, millions of dollars would be saved.

The Zinc Institute, several years ago, started an educational campaign centered upon the farm market. In exhaustive preliminary investigations, it was found that there existed a very definite disposition on the part of farmers to favor galvanized sheets in choosing roofing and siding material, and a great demand for reliable information which would help them to properly select, apply and maintain the best roofing material for their particular purpose.

Survey Developed Important Facts

Some farmers commented upon the difference in service life of galvanized sheets purchased at various times. They pointed to installations which had given 15, 20 or even more years of service, the sheets still being in excellent condition. In other cases, sheets had begun to rust in from 2 to 5 years after installation, much to the dissatisfaction of the buyer.

There was nothing for the Institute to do but to undertake a thorough study of the whole matter. It sent technical men into the field to examine hundreds of galvanized sheet roofs and to obtain full data as to their age and condition.

Continued on next page

These field studies showed that in practically every case of extended service life the original zinc coating averaged about 2 ounces per square foot. Such heavy-coated sheets gave satisfactory service even under comparatively difficult exposure conditions.

For instance, the Institute examined 2 buildings on a Missouri farmstead. The galvanized roofing on the residence is 35 years old and carried 2.8 ounces per square foot. The 1.8-ounce roofing on the barn is 21 years old - and the zinc coatings are still good on both. The roof on an Indiana barn is in perfect condition after 27 years of service; the weight of the coating on this galvanized roofing is 2.2 ounces. In Minnesota there is a galvanized roof on a barn with a 2-ounce coating which, after 20 years and more of exposure, continues to give good service.

A great many buyers of galvanized sheets are not aware of the fact that these sheets have a protective coating of zinc on them, nor do they know the importance of it and how necessary it is that this coating shall be heavy enough to stand the stress and strain of the elements.

Zinc as a Rust Preventive

While all types of iron and steel used as base metal for galvanized sheets are subject to rust, certain ones rust much more slowly than others. For instance, it has been shown that rust resistance can be increased by alloying with small quantities of copper.

For real prevention of rust, however, the usual method is to apply some form of protective coating which excludes air and moisture from the surface of iron or steel. For this purpose zinc is superior to all other metals. The U. S. Bureau of Standards Circular No. 80 states definitely that zinc forms "by far the best" protective metallic coating for the rust-proofing of iron or steel.

Effective as zinc is as a coating, it will not last forever, for any material exposed to the elements undergoes a certain amount of erosion, or slow wearing away. This is the case with zinc-coated sheets as with every other material. If the coating of these sheets is very thin, the base metal underneath the zinc soon becomes exposed and rust begins. If the coating is thicker, however, it resists the weathering action of the elements and gives protection against rust for a much longer period and, as a result, the service life of the sheets is greatly increased. In short, the heavier the zinc coating, the more durable the sheet.

Continued on next page

Users Protected by Quality Mark

To make these important facts generally known to users of galvanized sheets and to enable them, with ease and certainty, to identify sheets bearing heavy coatings, the "Seal of Quality" program was developed by the Zinc Institute. Two ounces of zinc per square foot (total on both sides) was adopted as the Seal of Quality standard coating and the Seal of Quality trade-mark was registered in the U. S. Patent Office, to be used only on sheets conforming to such standard.

Neither the American Zinc Institute nor its members produce galvanized sheets, but manufacturers are licensed to use the Seal of Quality trade-mark upon condition that they adhere strictly to the rigid specifications defined by the Zinc Institute. Nowadays Seal of Quality sheets are generally available, in the popular corrugated and V-crimped styles of roofing and siding, for most of the leading manufacturers of galvanized sheets have cooperated and are licensed to produce them.

SAFETY SUGGESTIONS TO OBSERVE IN BLASTING STUMPS AND BOULDERS IN CLEARING FARM LAND

EDITOR'S NOTE:- While no attempt has been made to cover all of the precautions to be taken when using dynamite for clearing fields of obstructions, the information given, if passed on to farmers, can be very helpful in preventing accidents.

By L. F. Livingston, Manager,
Agricultural Extension Section,
E. I. du Pont de Nemours & Co.

It can be said of dynamite, as of many other useful materials, that it is "a good servant but a bad master". Another thought to be kept in mind by the user of anything capable of causing injury, even a pocket knife, is that "accidents don't happen; they are caused." The twin causes of nearly all accidents of any character are lack of knowledge and carelessness. These are things which can not be over-emphasized at this time of the year, when a great deal of stump and boulder blasting is being done on farms. They are things which should be impressed on farmers by all in contact with them. However, the successful and safe use of dynamite for agricultural purposes by millions of farmers proves that the explosive can be used without hazards.

Some Safety Suggestions

The very fact that dynamite is intended to explode should be warning enough for care in handling. And there is no need to stress the fact that anything that will explode is dangerous. Shock, supplied by the firing of a blasting cap, is used to explode dynamite in doing useful work. But dynamite can be exploded by other kinds of shock, if of sufficient strength. Handle dynamite as carefully as eggs is a good rule to follow.

Keep metal away from the explosive. For instance, instead of a metal wedge, use a wooden one and a wooden mallet to open cases of dynamite, as a hammer in contact with metal may make a spark. When pushing dynamite down a hole and when tamping a charge with earth or other suitable material, use a wooden tamping stick to avoid a spark that might result from a metal tool in contact with stone in the ground.

A box of blasting caps and a case of dynamite make a dangerous combination. Keep them apart.

Continued on next page

Before firing a blast, remove all unused dynamite and blasting caps to a safe place.

Electric blasting, using electric blasting caps and a blasting machine, is the safest method. That is, provided the leading wires from the blasting machine are sufficiently long for the blaster to take a safe distance. Leading wires must not be attached to the blasting machine until after they have been attached to the wires of the blasting caps and the blaster and all others are safely away from the loaded blast.

The use of blasting caps and fuse is a safe way to blast, if the proper precautions are taken. Practice lighting short pieces of fuse before attempting to use fuse for a blast. Accidents have been caused when blasters "did not think" the fuse was lighted. Fuse burns at the rate of approximately one foot in 30 to 40 seconds. It costs little, so always use more than enough to get far away from a blast.

Some blasters, when working in "close quarters", erect tent-shaped barricades with the end facing the blast closed. This is not always necessary, but it is a commendable practice under certain conditions. Care should be taken not to blast too close to buildings, especially occupied ones. Similarly, care should be exercised when blasting near power lines; in short, anything that might be damaged.

Safe Blast Loading Practices

Holes under stumps should be deep enough to contain the required charge of explosive and permit proper tamping. In order to avoid waste of time and material, the blaster should study each stump before loading and locate the charge under the holding roots. Shallow loading causes fragments to fly a long distance. Stumps with hollow centers require distributed charges. A charge placed under the center of a hollow stump will blow small pieces a great distance, while leaving the roots in the ground. Face all blasts when firing, in order to be able to see in time any fragments thrown high in the air and which might fall near the blaster. Where several charges, distributed under a stump are necessary, the electric method of shooting must be used.

When necessary to spring a hole to receive a charge of dynamite, do not attempt to load until the hole has had a chance to cool off and there is no danger of burning leaves or other material. If two or more holes are to be sprung, do not load any of them until after all have been sprung and have cooled.

Never forget that instead of a misfire, it may be a hang-fire when a blast does not go off. This is especially important where fuse is used. If there are two or more charges used, watch out.

Continued on next page

Keep away for an hour, at least. The best rule is to make an examination the next day. No one has ever been injured by being over-cautious. These precautions apply in the case of boulder blasting as well as stump blasting; in fact, all blasting.

For mudcapping a boulder, use material that is entirely free of bits of rock and pebbles. Any hard material will be shot like a bullet from a rifle when a blast goes off.

More complete and detailed safety rules are available in the literature of manufacturers of explosives and that of the Institute of Makers of Explosives.

"I did not think."

"I did not see."

"I did not know."

The above are the usual excuses, provided the blaster survives, for accidents. Let it be repeated: "Accidents Don't Happen; They are Caused."

##########